

Date: Thu, 9 Dec 93 04:30:55 PST
From: Ham-Space Mailing List and Newsgroup <ham-space@ucsd.edu>
Errors-To: Ham-Space-Errors@UCSD.Edu
Reply-To: Ham-Space@UCSD.Edu
Precedence: Bulk
Subject: Ham-Space Digest V93 #104
To: Ham-Space

Ham-Space Digest Thu, 9 Dec 93 Volume 93 : Issue 104

Today's Topics:

 ANS-338 BULLETINS
 APT-Satellites: Report DEC 05, 1993
 NASA STS-61 Shuttle Retransmissions
 Oscar frequencies???
 STS-61 Keps GSFC-013
 TNC NB-96 Spike
 Two-Line Element Set Questions
 Two-Line Orbital Element Set: Space Shuttle

Send Replies or notes for publication to: <Ham-Space@UCSD.Edu>
Send subscription requests to: <Ham-Space-REQUEST@UCSD.Edu>
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Ham-Space Digest are available
(by FTP only) from UCSD.Edu in directory "mailarchives/ham-space".

We trust that readers are intelligent enough to realize that all text
herein consists of personal comments and does not represent the official
policies or positions of any party. Your mileage may vary. So there.

Date: Sun, 5 Dec 1993 17:01:30 MST
From: haven.umd.edu!darwin.sura.net!math.ohio-state.edu!news.cyberstore.ca!
nntp.cs.ubc.ca!alberta!nebulus!ve6mgs!usenet@ames.arpa
Subject: ANS-338 BULLETINS
To: ham-space@ucsd.edu

SB SAT @ AMSAT \$ANS-338.01
BRAMSAT NOTE ON DO-17 RETURN

HR AMSAT NEWS SERVICE BULLETIN 338.01 FROM AMSAT HQ
SILVER SPRING, MD DECEMBER 4, 1993
TO ALL RADIO AMATEURS BT
BID: \$ANS-338.01

PY2BJ0 Thanks Those Who Brought DOVE Back On-Line

As reported previously in the AMSAT News Service (ANS), DOVE is back on 2M with the DOVE control team continuing their efforts to restoring it to voice operations.

Junior de Castro (PY2BJO), of BRAMSAT, the Brazilian AMSAT group, which sponsored the DOVE satellite has the following to say regarding the satellite's recent return to 2M.

"After a long time DOVE is back again on 2M at 145.825 MHz. This project was created to provide an extremely simple way for those not familiar with satellite communications, especially those new to amateur radio, to take part in this exciting phase of our hobby. DOVE is finally beginning to live up to it original promise.

After its rebirth, we at BRAMSAT are receiving many E-mail messages and letters. Up to now they total 328, from 45 countries. We are happy with this response, but we will be even happier when DOVE again becomes the popular satellite that we always knew it could be."

/EX

SB SAT @ AMSAT \$ANS-338.02

AMSAT OPS NET SCHEDULE

HR AMSAT NEWS SERVICE BULLETIN 338.02 FROM AMSAT HQ
SILVER SPRING, MD DECEMBER 4, 1993
TO ALL RADIO AMATEURS BT
BID: \$ANS-338.02

Current AMSAT Operations Net Schedule For AO-13

AMSAT Operations Nets are planned for the following times. Mode-B Nets are conducted on AO-13 on a downlink frequency of 145.950 MHz. If, at the start of the OPS Net, the frequency of 145.950 MHz is being used for a QSO, OPS Net enthusiasts are asked to move to the alternate frequency of 145.955 MHz.

Date	UTC	Mode	Phs	NCS	Alt NCS
12-Dec-93	0435	B	180	W9ODI	WB6LLO
3-Jan-94	0200	B	160	WA5ZIB	N7NQM

Any stations with information on current events would be most welcomed. Also, those interested in discussing technical issues or who have questions about any particular aspect of OSCAR statellite operations, are encouraged to join the OPS Nets. In the unlikely event that either the Net Control Station (NCS) or the alternate NCS do not call on frequency, any participant is invited to act as the NCS.

Slow Scan Television on AO-13

SSTV sessions will be held on immediately after the OPS Nets a downlink on a Mode-B downlink frequency 145.960 MHz.

/EX

SB SAT @ AMSAT \$ANS-338.03

WEEKLY OSCAR STATUS REPORTS

HR AMSAT NEWS SERVICE BULLETIN 338.03 FROM AMSAT HQ

SILVER SPRING, MD DECEMBER 4, 1993

TO ALL RADIO AMATEURS BT

BID: \$ANS-338.03

Weekly OSCAR Status Reports: 27-NOV-93

AO-13: Current Transponder Operating Schedule:

L QST *** AO-13 TRANSPONDER SCHEDULE *** 1993 Nov 15-Jan 31

Mode-B : MA 0 to MA 95 ! / Eclipses, max

Mode-B : MA 95 to MA 180 ! OFF Dec 07 - 24. < duration 136

Mode-B : MA 180 to MA 218 ! \ minutes.

Mode-S : MA 218 to MA 220 !<- S beacon only

Mode-S : MA 220 to MA 230 !<- S transponder; B trsp. is OFF

Mode-BS : MA 230 to MA 256 ! Blon/Blat 240/-5

Omnis : MA 250 to MA 150 ! Move to attitude 180/0, Jan 31

AO-13 will experience another partial solar eclipse on 1993 Dec 13 [Mon]. It sees the Moon eclipse the Sun from 10:09 - 10:59 UTC with a maximum 53% obscuration at 10:34 UTC. This is Orbit #4211 MA 73-92. The encounter will be "visible" on the telemetry to stations throughout the USA and Japan. Reports would be appreciated. Stations who observed this spectacular eclipse of Dec 13 will know what to look for. Eclipses of the sun by earth commence on Dec 07 [Tue] and continue until Dec 24 [Fri]. The eclipses are, of course, total. The maximum lasts 2 hours and 16 minutes, and is the longest AO-13 has ever experienced. The telemetry during these outages is very interesting, particularly the spacecraft temperatures; some reach -40 C. The Mode-B transponder will be OFF from MA 95 to 180 during this two week period. [G3RUH/DB2OS/VK5AGR]

FO-20: The following is the FO-20 operating schedule:

Analog mode: 01-Dec-93 08:43 -to- 07-Dec-93 7:16 UTC

15-Dec-93 07:41 -to- 22-Dec-93 8:05 UTC

Digital mode: otherwise noted above. In December, analog mode and digital mode will be ON alternately for a week, respectively.

[JJ1WTK]

RS-12: KA3TGY reports that he had a great deal of fun on RS-12 this past week when he made a contact with CY0SAB. KA3TGY used a R-7 vertical with 100 watts output to make the contact on RS-12 on 15M. This was KA3TGY's first contact and he notes that he never realized what he was missing by not working RS-12! [KA3TGY]

The AMSAT NEWS Service (ANS) is looking for volunteers to contribute weekly OSCAR status reports. If you have a favorite OSCAR which you work on a regular basis and would like to contribute to this bulletin, please send your observations to WD0HHU at his CompuServe address of 70524,2272, on INTERNET at wd0hhu@amsat.org, or to his local packet BBS in the Denver, CO area, WD0HHU @ W0LJF.#NECO.CO.USA.NOAM. Also, if you find that the current set of orbital elements are not generating the correct AOS/LOS times at your QTH, PLEASE INCLUDE THAT INFORMATION AS WELL. The information you provide will be of value to all OSCAR enthusiasts.

/EX

Date: Mon, 6 Dec 1993 08:55:28 GMT
From: Germany.EU.net!netmbx.de!zrz.TU-Berlin.DE!zib-berlin.de!ceres.fokus.gmd.de!
gmd.de!peter.henne@gmd.de@uunet.uu.net
Subject: APT-Satellites: Report DEC 05, 1993
To: ham-space@ucsd.edu

Observed at station 50.7 NLat, 7.1 ELon, DEC 05, 1993

NOAA-9: APT 137.62 On
NOAA-10: APT 137.50 On
NOAA-11: APT 137.62 On
NOAA-12: APT 137.50 On
Meteor 2-21: APT 137.85 ??? *
Meteor 3-3: APT 137.30 On
Meteor 3-5: APT 137.30 ON again **

* Meteor 2-21 now orbits around the terminator and I could not receive any APT-Signal from the dim illuminated northern hemisphere.

** Meteor 3-5 is active again after a long time of silence. Good vis-images from noon-ascending passes, some few streaks, very good signal-strength. As Meteor 3-3 too is drifting more towards morning darkness, Meteor 3-5 will be the only source for good vis-imagery from the northern hemisphere during the next dark month.

IR-imaging-format from dark parts of the orbit is somewhat uncommon: 20 lines per minute as was used first by Meteor 2-16, Meteor 3-1 and Meteor 3-2.

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+-----+
|Peter Henne (peter.henne@gmd.de)      |
|          (henne@gmd.de)              |
|German Nat.Research Center.f.Comp.Science |
|D-5205 St.AUGUSTIN 1                  |
|Fed.Rep. of Germany                   |
+-----+
```

Date: 6 Dec 1993 06:22 EDT
From: agate!howland.reston.ans.net!europa.eng.gtefsd.com!news.umbc.edu!
haven.umd.edu!cs.umd.edu!skates.gsfc.nasa.gov!nssdca.gsfc.nasa.gov!
stocker@ames.arpa
Subject: NASA STS-61 Shuttle Retransmissions
To: ham-space@ucsd.edu

In article <CHGp1u.M9t@mentor.cc.purdue.edu>, bap@mace.cc.purdue.edu (Bret Pennington) writes...

>Last evening from West central Indiana I tried all evening
>to get the GARC SSB frequencies 3860, 7185, 14295, 21395, and 28650.
>3860 had a lot of stuff on it but I couldn't get it clearly. I heard
>someone say "Endeavor" faintly but that was all. When I do get something
>what should I expect? Continuous transmission? Also where is the GARC
>transmitter and what is its power and azimuth? Is Indiana
>too far away to get it?
>I am using a DX-390 with 140 longwire.
>Did anyone else hear anything.
>I did get the launch on 5180 SSB at 427 AM EST :-)
>
>Sincerely,
>
>BRET A. PENNINGTON
>COMPUTER TECHNICIAN
>DEPARTMENT OF EARTH AND ATMOSPHERIC SCIENCES
>CIVL 4252 4-0678 (317-494-0678)
>PURDUE UNIVERSITY
>WEST LAFAYETTE, INDIANA 47907
>bap@mace.cc.purdue.edu

No you won't get continuous transmission on any of the retransmission. This is a true retransmission. When there is space to ground communications going on then you will hear something. For example, if the crew is scheduled to sleep then nothing is sent obviously.

The output signals should be fairly strong from GARC but propagation and your rig/antenna will still be the determiner of how well you can receive.

Erich
N30XM

Date: 6 Dec 93 17:31:39 -0500
From: ulowell!woods.uml.edu!murphyed1@uunet.uu.net
Subject: Oscar frequencies???
To: ham-space@ucsd.edu

Can anyone send me an update of the up/downlink frequencys of the ham satelites that are up there??? I am trying to convince my father (N1CDC) to invest :-)
in the 736 uhf/vhf all mode tranciever. and the downlinks of the stuff (more than just rs-10/11) would be a great help untill we join AMSAT...

Thanks in advance...

Ed...

```
==== Ed Murphy      (The University disclaims everything!)  --- | /  ----
| Internet Mail :: Murphyed1@woods.ulowell.edu             /|\ |/   \
==== "Warning, Phi Kap's May Be Habit Forming!!!"          \|\ | \   /
| Groundmail (The Slow Way) 1 University Ave. Box 1136    --- | \  ----
===                               Lowell, Ma. 01854 U.S.A.    Phi Kappa Sigma
                                                Gamma Upsilon Chapter
```

Ham Radio -- N10QF

Date: Tue, 7 Dec 1993 13:01:07 GMT
From: ftpbox!mothost!lmpsbbbs!news@uunet.uu.net
Subject: STS-61 Keps GSFC-013
To: ham-space@ucsd.edu

STS-61 KEPLERIAN ORBITAL ELEMENTS

STS-61
1 22917U 93075A 93339.50807012 0.00000289 00000-0 19876-4 0 136
2 22917 28.4705 39.9519 0005036 48.7431 311.3588 14.92978392 481

Satellite: STS-61
Catalog number: 22917
Epoch time: 93339.50807012 (05 DEC 93 12:11:37.26 UTC)

Element set:	GSFC-013	
Inclination:	28.4705 deg	
RA of node:	39.9519 deg	Space Shuttle Flight STS-61
Eccentricity:	0.0005036	Keplerian Elements
Arg of perigee:	48.7431 deg	
Mean anomaly:	311.3588 deg	
Mean motion:	14.92978392 rev/day	Semi-major Axis: 6966.7867 Km
Decay rate:	0.29E-05 rev/day*2	Apogee Alt: 591.91 Km
Epoch rev:	48	Perigee Alt: 584.89 Km

NOTE - This element set is based on NORAD element set # 013.

Date: Fri, 3 Dec 1993 13:46:10 GMT
From: swrinde!cs.utexas.edu!utnut!torn!nott!cunews!freenet.carleton.ca!
Freenet.carleton.ca!ae517@network.ucsd.edu
Subject: TNC NB-96 Spike
To: ham-space@ucsd.edu

Date: 9 Dec 93 07:36:37 GMT
From: ogicse!emory!europa.eng.gtefsd.com!paladin.american.edu!afterlife!
blackbird.afit.af.mil!tkelso@network.ucsd.edu
Subject: Two-Line Element Set Questions
To: ham-space@ucsd.edu

Why is it that separate element sets are generated for both STS 61 and the Hubble Space Telescope (HST) when they are docked together? Why aren't these element sets identical?

Since these questions have come up several times during the STS 61 mission to service the Hubble Space Telescope and arise from time to time with regard to the Mir space station, I thought I'd take this opportunity to answer them in some detail here.

NORAD has responsibility for tracking all man-made objects in earth orbit. In performing this function, NORAD maintains a catalog of each individual it tracks, even if that object is subsequently docked to another object. Such is the case for STS 61 and the HST or the various modules of the Mir space station (Mir, Kvants 1 and 2, Kristall, and various Soyuz and Progress). And they also maintain separate element sets for each object.

Of course, these objects are physically locked together and the observations

collected for one object could be used for updating the elements for all objects. But that's not necessarily how it works. Since NORAD has to track over 7,000 objects every day, the process is automated. Here's how it works.

Observations are collected for an object and used to generate a two-line element set using a process known as differential corrections. The two-line element set is used to predict the observations (using the SGP4 orbital model) and the differences between actual and predicted observations are compared. A correction to the two-line element set is determined which moves to minimize these differences (something like doing a multi-dimensional Newton search). This process is repeated until convergence is reached.

The element set generated by this process will be used until subsequent observations show its predictions to be off by more than some preset amount. For the data I make available, that is five kilometers (90 percent confidence interval). Five kilometers may seem like a large distance until you realize that most of the error will be in the in-track direction and that it amounts to less than one second's travel in near-earth orbits. Once the current element set is determined to be out of tolerance, a new element set is generated.

Now, since all observations have error, the element sets generated will remain in tolerance for differing periods of time. How long will depend on the site used to collect the observations, the viewing geometry, changes in atmospheric density or spacecraft attitude, maneuvers, and so on. As such, updates to separate components of a docked structure will be updated at different times.

Okay, so even if NORAD tracks each object separately and maintains separate element sets, why are the element sets different? To understand the answer to this question requires a basic understanding of satellite orbits. Only ideal orbits describe true ellipses and have constant orbital elements. Real orbits experience both periodic and secular (trending) effects in their elements. Because of this, there are various ways of describing orbital elements.

One way is to use osculating (touching) or instantaneous orbital elements, that is, the instantaneous values of each element at the specified epoch (time). The other is to use mean orbital elements. The NORAD two-line element sets use mean orbital elements. In *neither* case will the elements generated be constant over time. In the SGP4 orbital model, the mean is extracted in a particular way to not only allow combination with the various perturbing forces (geopotential, atmospheric drag, solar/lunar gravitational effects, and solar radiation pressure) to generate accurate predictions but to also permit quick calculations (it is an analytical model which means you can plug in a time and get out a position and velocity *without* numerical integration).

To develop a better understanding of this concept, try to describe the mean x and y position of an object traveling along a circle. Taken over a long

enough period of time, it is the origin of the circle -- not terribly useful. To be more specific, you must specify a time associated with your mean -- change the time and you change the mean. Therefore, if two or more objects are docked together in earth orbit, their orbital elements will not match unless the epoch of the element sets are identical. And even that assumes the elements were generated from identical observations with identical update processes. However, predictions of each object's position and velocity, using the NORAD SGP4 orbital model, should be the same within the error tolerance.

Remember, I did not develop this process but am only explaining it. While I can think of ways to improve it, you must also remember that it has evolved slowly over time and is resistant to radical changes (as is any bureaucracy). You may be thinking that it would make more sense to generate only one element set for a group of docked objects, realizing that the error in prediction can be on the order of five kilometers! You might think that a single element set would result in no error. However, the error is still there -- a single element set just seems more consistent. Actually, multiple element sets provide the advantage of redundancy -- protecting you from the occasional bad element set.

Before I quit, I'd like to take this opportunity to explain why it is important to use an orbital prediction program based upon the NORAD SGP4 orbital model when using the two-line element sets. As with fitting any kind of data, the coefficients determined depend upon the model used. Imagine a set of points (with noise) that you want to fit a curve to and determine the constant term. If you use a linear fit, you get one value; a quadratic fit yields another; and a cubic fit yet another. If you take the value for the cubic fit and apply a linear projection, you won't get very good results.

The same is true for the NORAD two-line element sets. If you take the mean values from these element sets (the constant terms) and put them into a different orbital model (say, a simple two-body model), you won't get very good predictions. Likewise, if you take some other data (for example, the AMSAT data) and "convert" it to the two-line format, that does NOT make it two-line data compatible with the SGP4 model. I **strongly** discourage people from converting other data into the two-line format, particularly if you are reposting it, because the two-line format implies that the data was generated with the NORAD SGP4 orbital model and will produce compatible results. You will cause other users a great disservice by distributing converted two-line element sets since they will **not** produce accurate predictions.

I have made, and will continue to make, every effort to make NORAD two-line element sets and the associated orbital models available to the satellite community. I welcome you to take advantage of these materials to produce the most accurate predictions readily available. I hope this answer your questions. - TS

--

Dr TS Kelso

Assistant Professor of Space Operations

tkelso@afit.af.mil

Air Force Institute of Technology

Date: Tue, 7 Dec 1993 12:56:30 GMT
From: ftpbox!mothost!lmpsbbs!news@uunet.uu.net
Subject: Two-Line Orbital Element Set: Space Shuttle
To: ham-space@ucsd.edu

}HST

{1 20580U 90037B 93339.57493170 .00028070 00000-0 26172-2 0 3718

{2 20580 28.4705 39.5197 0004900 49.8661 310.3057 14.92996262 474

}STS 61

{1 22917U 93075A 93340.21665509 .00000271 00000-0 18280-4 0 161

{2 22917 28.4699 35.3802 0005051 69.3021 146.6976 14.92803280 572

}--

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}tkelso@afit.af.mil

Air Force Institute of Technology

NASA Spacelink BBS also provides Keps. Their number is (208)895-0028
or on internet 192.149.89.61 The internet address accesses both an ftp site
and the BBS on telnet. The ftp login is anonymous and password is guest.

Mr. Kelso, please post the element set number next time. Also, the Hubble
keps won't be valid any longer since they made the maneuver to back away
from the bad solar array.

73,

Bruce, WB4YUC, e1 YUCC0. . .

Date: (null)
From: VK7KKK@VK7GL.TAS.AUS.OC
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End of Ham-Space Digest V93 #104
